

3. (Amended) [The] A deformable mirror comprising:
a vertical comb drive; and
a reflective surface attached to said vertical comb drive [according to claim 1],
wherein said vertical comb drive comprises a first array of stationary elements and a second
array of moving elements correspondingly interspersed with said first array, said reflective
surface being attached to said second array.

Claim 13, line 1, after "12," insert --further comprising--.

Claim 14, line 2, delete "of said".

Claim 16, line 1, change "1" to --3--.

REMARKS

Reconsideration and allowance in view of the foregoing amendments and
following remarks are respectfully requested.

Claims 1-20 remain pending in this application. Of claims 1-20, claims 1-18 are
presented for consideration at this time.

The amendments, which will be discussed below, merely incorporate the
independent features of claim 1 into dependent claims 2 and 3. For that reason, this
Amendment should not necessitate a Final Rejection.

Rejections Under 35 U.S.C. § 102

Claims 1 and 16-18 were rejected under 35 U.S.C § 102(e) as being anticipated by
La Fiandra (U.S. Patent No. 5,745,278). Applicants respectfully traverse.

Claim recites a deformable mirror having a vertical comb drive, as well as a
reflective surface attached to the vertical comb drive.

Section 102 requires a cited reference to explicitly teach each feature recited by a claim. However, the La Fiandra reference does not teach a deformable mirror having a vertical comb drive with a reflective surface attached thereto.

Rather, the La Fiandra reference explicitly teaches an alternative to a comb drive. Specifically, throughout the La Fiandra reference, references are made to a mirror actuator configuration formed of piezoelectric actuators. It is well known that piezoelectric actuators are different than comb drives. For instance, piezoelectric actuators expand or contract under applied voltage. For that reason, a large voltage is generally needed to drive a piezoelectric actuator. By contrast, comb drives are actuated in response to electric fields applied between two electrically separated parts, requiring less force and therefore lower voltage than piezoelectric actuators. Only the Applicants for this patent configure a deformable mirror with vertical comb drive actuators in the manner claimed.

Moreover, because the La Fiandra reference teaches an actuator configuration relying on piezoelectric actuators as described above, the La Fiandra reference fails to explicitly teach a deformable mirror having vertical comb drives as required by claim 1. Consequently, claims 1 and 16-18 are not anticipated by the La Fiandra reference. Applicants therefore request withdrawal of the Section 102 rejection of claims 1 and 16-18 in view of La Fiandra.

Claims 1-5, 7 and 11-18 were rejected under 35 U.S.C. § 102(e) as being anticipated by Kiang et al. (U.S. Patent No. 5,867,297). Applicants respectfully traverse.

Claim 1 recites a deformable mirror having a vertical comb drive and a reflective surface attached to the vertical comb drive.

Section 102 requires a cited reference to explicitly teach each feature recited by a claim. However, the Kiang reference does not teach a deformable mirror, nor does it include a vertical comb drive.

Rather, the mirror of Kiang is merely rotated about the axis along torsion bars 70, as illustrated by Figs. 5A and 5B and arrows 68 and T provided in Figs. 4 and 6. Furthermore, rather than teaching a vertical comb drive, the Kiang reference describes a horizontal comb drive. The horizontal position of the comb drive is depicted in Fig. 4 and described by explicit reference to fabrication of the mirror and thus comb drive within the horizontal plane of a semiconductor, from which it must be moved to a vertical plane. See column 1, lines 59-63 and column 2, lines 2-4.

Thus, the Kiang reference fails to teach the features recited by claim 1. For at least these reasons, Applicant requests withdrawal of the Section 102 rejection of claim 1, and claims 2-5, 7 and 11-18 depending therefrom.

In addition, claims 11 and 13 and claims 14-15 recite features not taught by the Kiang reference. Specifically, claims 11 and 13 concern providing voltage individually to each of several elements or actuators within the arrays of the vertical comb drive, thereby providing for deformation of the mirror. The Kiang reference fails to teach these features, and would not be obviously modified to include these features since that reference does not concern a deformable mirror. Claims 14-15 recite springs for individually suspending actuators within an array of vertical comb actuators, and an anchor for supporting those springs. Again, the Kiang reference fails to teach these features and, without teaching a deformable mirror, it would not be obvious to modify the Kiang reference to include these features. Therefore, notwithstanding the allowability of

claim 3 upon which they depend, claims 11 and 13-15 are believed to be allowable over the cited Kiang reference.

Rejection Under 35 U.S.C. § 103

Claim 6 was rejected under 35 U.S.C. §103 as being rendered obvious by the Kiang reference. Applicant respectfully traverses.

Claim 6 requires the use of stationary and movable elements within the actuator of the vertical comb drive that are circular. The advantage resulting from this structural requirement is a uniform, yet less rigid, distribution of force over a portion of the mirror surface, as generally described throughout the specification. Given this advantage, the circularity recited by Figure 6 is not arbitrary. Rather it has a specific function and should be given patentable weight for that reason.

As acknowledged in item 6 of the Office Action, the Kiang reference does not suggest this feature.

Consequently, Applicants request withdrawal of the Section 103 rejection to claim 6.

Conclusion

All objections and rejections being overcome, it is respectfully submitted that the present application is in condition for allowance and a Notice to that effect is earnestly solicited.

In the event that any outstanding matters remain in this application, Applicant requests that the Examiner contact Karl Renner (Reg. No. 41,265) at (703) 205-8034 to discuss such matters.

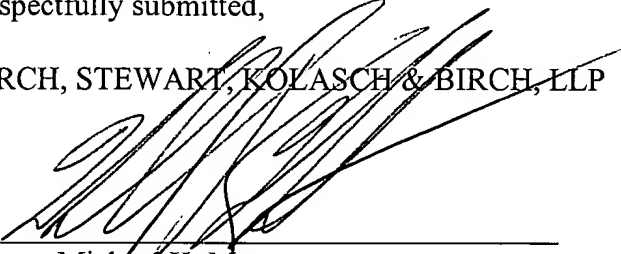
Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), the Applicants respectfully petitions for a one month extension of time for filing a reply in connection with the present application and the required fee of \$55.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and further replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or 37 C.F.R. § 1.17, particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By



Michael K. Mutter
Reg. No. 29,680

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

2119-107P
MKM/WKR:jmj